ACTIVE REFRIGERATION FOR SPACE ASTROPHYSICS MISSIONS

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The use of cryogen dewars limits mission lifetime, increases sensor mass, and increases program engineering and launch costs on spacebased low-background, precision-pointing instruments, telescopes and interferometers. The recent development of long-life mechanical and sorption compressor driven J-T coolers capable of refrigeration to temperatures below 2.5 Kelvin, combined with the innovative use of cryogenic radiators and thermally advantageous orbits, is enabling, long **duration** (> 5 years) missions that can perform high resolution infrared and sub-mm wave astronomical observations. In addition, it is clear that the low mass and input power requirements associated with several of these long-life cooling techniques could lead to the development of a new class of small, inexpensive space observatories.

The design, and component performance test results, of a brassboard 10 K cooler for such an application is discussed. The development of this cooler will be completed later this year. It is intended that this refrigerator will be integrated with a 5 to 30 micron camera being developed at JPL, for astronomical observations. The resulting Long Life Infrared Observational System consists of a test bed cooler, mid-IR camera within a dewar, and power control and readout electronics. Demonstrating integrated operation through ground-based astronomical imaging will validate the compatibility of the involved technologies and alleviate concerns such as temperature stability, vibration and emi for future spaceborne applications. A cooler, based on this design can be constructed for flight missions which provides 10 mW of continuous refrigeration with an input power of less than 10 watts and a mass of six kg.

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Prefer Oral Session